
Applying Codec2 To Amateur Satellite Operations

Bruce Robertson, VE9QRP
Amsat Symposium, 2012



QSO with ZL3IN in Early 2011



About 45 min.
conversation



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About 45 min.
conversation

The complete
recording of both
sides of the
conversation could
fit on a 1.4MB
floppy disk



Codec2

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- } Attuned to the human voice



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- } Open-source
- } Under active development



History

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History

- } Bruce Perens, K6BP, noted the absence of a free and open-source low-bitrate voice codec
- } Encouraged David Rowe, VK5DGR, to repurpose the work in his Ph.D. thesis to this end
 - } Built community and code base
 - } Won ARRL technical innovation award in 2012



Software

} Free and open source



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- } Codecs from 3200 bit/s to 1200



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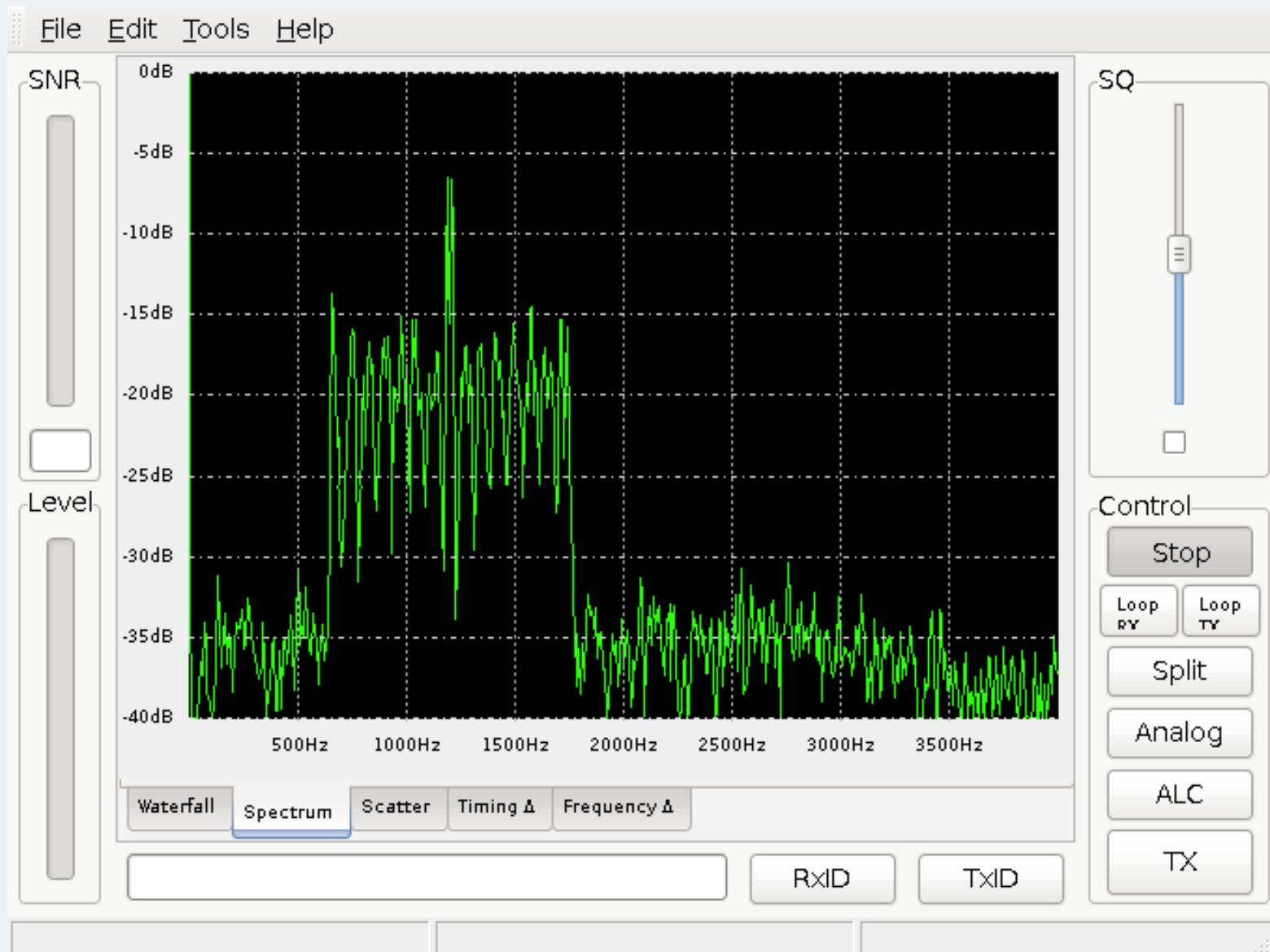


Software

- } Free and open source
- } Codecs from 3200 bit/s to 1200
- } Unix command line for now, but Dave Whitten, KD0EAG is making a GUI for Windows, etc.
- } Modems:
 - } 1400 bit/s FDMDV
 - } 4800 and 2400 (early) GMSK



FDMDV2 Teaser



Hardware

- } Easily cross-compiled to ARM
 - } Nokia N800: 330 MHz ARM11



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 - } Pandaboard: ARM Cortex-9
- } Integer FFT not yet integrated
- } But many satellite stations have a computer attached



Philosophy

Comment pending on "Conversation Using Codec2"  Inbox x  

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Philosophy

- } *Not* about
 - } Hijacking D-Star



Philosophy

- } *Not* about
 - } Hijacking D-Star
- } Current emphasis on HF voice



Philosophy

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Kristoff Bonne, ON1ARF



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For example?



I. Experiment With Today's Satellites

} FDMDV through FM birds



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- } FDMDV through FM birds
- } TWO FDMDV channels ($\times 1050$ Hz) through one FM bird



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- } Who's going to call that an Easy-Sat? ☺



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 - } Who's going to call that an Easy-Sat? ☺
- } FDMDV signal acquisition and doppler correction



2. A Codec2 Demo. Mode

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 - } Allows a functionally digital mission to assist in improving voice communications or



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2. A Codec2 Demo. Mode

- } Codec2 can bridge the voice / digital gulf
 - } Allows a functionally digital mission
 - } To assist in improving voice communications
 - } To provide voice communications
 - } No more 'beep boxes'
- } Digital comms. should be arranged with this possibility in mind
 - } 1200 AFSK won't cut it
 - } 2000-2400 BPSK/QPSK?



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- } Offers interesting research problems for undergraduate cubesat programs:
 - } E.g., what sort of modulation technique and how much error correction would be helpful in LEO?



4. An In-flight Modulation Mode

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- } Analog voice uplink and Codec2 voice down
- } Advantages:
 - } More simple station set-up
 - } Transmission efficiency for satellite
- } Challenge:
 - } Including efficient codec2 modulation code in on-board computing system



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 - } (Twit's live stream to shoutcast)
 - } `gst-launch souphttpsrc location=http://twit.am:80/listen !
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```
 - } Introduce random errors into FEC-encoded Codec2 to evaluate interleaving approaches
 - } Extra points: make a website that crowd-sources the scoring of various approaches



Last Word to the Codec

- } 2.1 kB message at 1200 bits/s
- } Come see me for a record/playback session with my laptop

